

When Does a Molecule Become a Polymer?

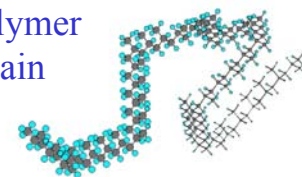
Alexei P. Sokolov, University of Akron, DMR-0315388

It is known that many properties of polymeric materials depend on molecular weight. We discover that chain statistics, i.e. the way a polymer chain approaches state of a random coil, plays crucial role in many macroscopic properties of polymers, including glass transition temperature T_g , density, elasticity and fast (GHz-THz) dynamics. The role of the chain statistics in these properties was not appreciated and the mechanism of how the chain statistics affects these properties remains unclear. This discovery calls for revision of many traditional ideas used in polymer physics.

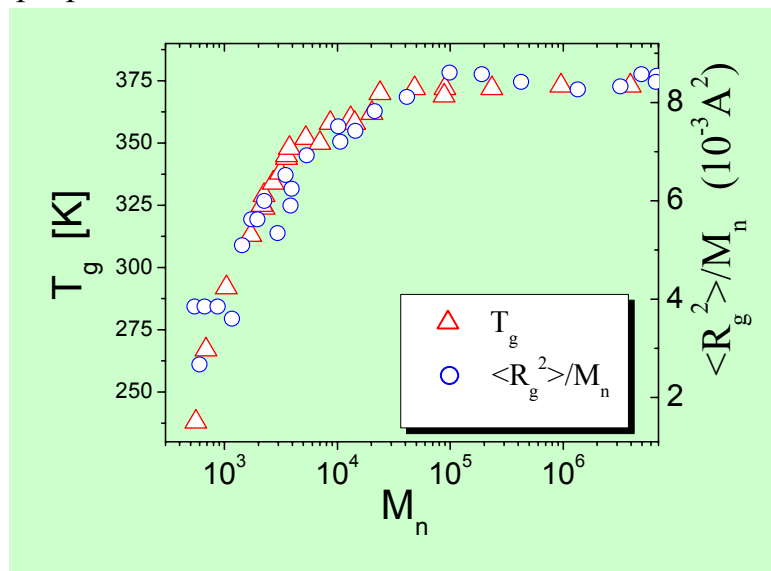
Small molecule



Polymer chain



How long should be a chain to exhibit polymeric properties?



Macromolecules **36**, 9924 (2003); *Macromolecules* **37**, 161 (2004) and *J.Polym.Sci.B* **42** (2004, in print)

Correlation of the molecular weight dependence of T_g with the size of the polymer coil R_g^2/M observed for polystyrene.

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Education:

Three PhD students, Y. Ding (3rd year) B.Begen (2nd year) and J.H. Roh (2nd year), 1 REU undergraduate student, G. Burg, a senior post-doctoral scientist: Dr. A. Kisliuk and a visiting scientist Dr. V. Novikov are currently involved in this research. Y. Ding plans to graduate with PhD during the next (2004-2005) academic year.

The picture on the right shows PI's group in 2003.

Outreach:

Each year, graduate students from Dr. Sokolov's group are involved in Science Fair and in Upward Bound Program for high school students sponsored by the University of Akron.

